

C-A OPERATIONS PROCEDURES MANUAL

1.25 Alternate fall protection plan for leading edge work during precast concrete erection and disassembly.

CAD performs leading edge precast concrete work when erecting and disassembling shield blocks for radiation shielding of beam lines. In general, this work involves the placement of precast shield blocks where the location (height, width, length) is constantly changing. We have found that standard fall protection techniques present a greater hazard. CAD proposes to establish a "Controlled Access Zone and Plan" for this work.

The following interpretation is taken from a 2004 OSHA document in response to a question as to when it is permissible to establish a controlled access zone in lieu of fall protection for leading edge work during precast concrete construction.

Standard Interpretations

04/20/2004 - Alternative fall protection for leading edge work during precast concrete erection.

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• **Standard Number:** [1926.501\(b\)](#); [1926.501\(b\)\(12\)](#); [1926.502\(k\)](#)

Title 29 CFR 1926.501(b)(12) states:

Precast concrete erection. Each employee engaged in the erection of precast concrete members (including, but not limited to the erection of wall panels, columns, beams, and floor and roof "tees") and related operations such as grouting of precast concrete members, who is 6 feet (1.8 m) or more above lower levels shall be protected from falling by guardrail systems, safety net systems, or personal fall arrest systems, unless another provision in paragraph (b) of this section provides for an alternative fall protection measure.

Exception: **When the employer can demonstrate that it is infeasible or creates a greater hazard to use these systems**, the employer shall develop and implement a fall protection plan which meets the requirements of paragraph (k) of 1926.502.

NOTE: There is a presumption that it is feasible and will not create a greater hazard to implement at least one of the above-listed fall protection systems.

Accordingly, the employer has the burden of establishing that it is appropriate to implement a fall protection plan which complies with §1926.502(k) for a particular workplace situation in lieu of implementing any of those systems. [Emphasis added.]

One of the many construction activities at CAD is the erection or disassembly of pre-cast concrete as radiation shielding for beam transport caves. In most cases, erection of one beam line and disassembly of another are happening at the same time. These caves are typically 12' wide by 10' high, surrounded with pre-cast shielding. The walls are made from modular concrete, typically having a total width of 12' and the roof is made from modular concrete having a total height of ~10'. Working height therefore starts at ~4.5' and extends to ~20'

CAD uses a large inventory of existing pre-cast shield blocks. This shielding varies in size and weight from 1'x1'x1' weighing 250#, to 2'x4'x34' weighing 34 tons. Most of our shielding has a single lifting lug recessed into the center of the block. This lifting lug must be connected to the crane hook and then disconnected after the block is positioned. This must be accomplished from both sides of the block due to the recessed lug. The top surface of the block is therefore used to access the lifting lug. We have found that attempts to use the lifting lug of the previous block as the tie off point for fall protection results in personnel tripping over the lanyard, creating a greater hazard at the leading edge of the construction activity. Attempts at using an overhead tie-off point resulted in this restricting the crane movement, with the potentially serious consequence of the shield block hitting the lanyard, knocking personnel off the block. Scientific equipment installed inside and outside the beam lines preclude the use of safety nets.

Examples of where this may apply:

- 1) The installation & removal of multi-layered concrete for shielding or storage
- 2) The installation or removal of beam cave roofs and sidewalls
- 3) The removal and installation of shielding to access equipment for repair or replacement.
- 4) In certain circumstances, the assembly or disassembly of large detector arrays where leading edge work is required.

We therefore propose the use of a "Controlled Access Zone and Plan" for this leading edge work. This is essentially a formal approach to the fall protection we have been using for the past 40 years.

Fall protection plan using a Controlled Access Zone

This plan is only applicable for leading edge work, usually pre-cast concrete installation or removal, where the leading edge location is constantly changing.

Location --- CAD areas

Labor --- BNL/PE Riggers and certain trained individuals

Plan date -- 11/05

Prepared by ----- A.P.

Approved by ----

The purpose of this plan is: (a) To supplement our standard safety policy by providing safety standards specifically designed to cover fall protection on leading edge, pre-cast concrete installation and removal; (b) to ensure that each employee is trained and made aware of the safety provisions which are to be implemented by this plan prior to the start of construction.

This Fall Protection Plan addresses the use of other than conventional fall protection, as well as identifying specific activities that require non-conventional means of fall protection. These areas include:

- a. Connecting / un-connecting shield block lifting fixtures
- b. Leading edge work
- c. Unprotected sides or holes

This plan is designed to enable personnel to recognize the fall hazards for this work and to establish work practices that are to be followed in order to prevent falls from the shielding. Each employee will be trained in these work practices and strictly adhere to them. If, in the employee's opinion, there is a concern in using these work practices, the employee is to notify the Rigging Supervisor of the concern and the concern will be addressed before proceeding.

It is the responsibility of the Liaison Engineer to include this plan in the work planning process and FES work order system if leading edge work is to be accomplished.

It is the responsibility of the Rigging Supervisor or designee to implement this Fall Protection Plan. The Rigging Supervisor is responsible for observational safety checks of rigging operations and to enforce the safety policy and work practices. He is also responsible to correct any unsafe acts or conditions immediately.

It is the responsibility of the Safety Monitor to warn personnel in the Control Zone of dangerous conditions or work practices. (refer to pg. 5)

It is the responsibility of the employee to understand and adhere to this plan and to bring to management's attention any unsafe or hazardous conditions or acts that may cause injury to either themselves or any other employees.

I. Fall Protection System

Where conventional fall protection is not feasible or creates a greater hazard at the leading edge and during block connecting / un-connecting activities, we plan to do this work using a safety monitor system and only expose a minimum number of employees for the time necessary to accomplish the job. Only trained personnel will be permitted to enter the controlled access zones and work without the use of conventional fall protection.

A safety monitor shall be identified, usually the Rigging Group Leader, who will warn personnel of the hazards and ensure this procedure is followed.

Only authorized individuals with the appropriate experience, skills, and training will be able to work in the Control Zone. All employees that will be working under the safety monitoring system shall have been trained and instructed in the following areas:

1. Recognition of the fall hazards in the work area (at the leading edge and when making initial connections-disconnects).
2. Avoidance of fall hazards using established work practices.
3. Recognition of unsafe practices or working conditions that could lead to a fall, such as windy conditions when working outdoors.
4. The function, use, and operation of safety monitoring systems, guardrail systems, body belt/harness systems, control zones and other protection to be used.
5. The correct procedure for erecting, maintaining, disassembling and inspecting the system(s) to be used.
6. Knowledge of the construction and rigging sequence.

A work review meeting will take place prior to starting work involving all members of the rigging crew, crane crew and supervisors of any other affected personnel. This meeting will be conducted by the Rigging Supervisor. During this pre-work conference, erection procedures and sequences pertinent to this job will be thoroughly discussed and safety practices to be used throughout the project will be specified. Further, personnel will be informed that the controlled access zones are off limits to all personnel other than the designated personnel specifically trained to work in that area.

Safety Monitoring System

A safety monitoring system utilizing a competent / trained person that is responsible for recognizing and warning employees of fall hazards. The duties of the safety monitor are to:

1. Warn personnel when approaching the open edge in an unsafe manner.
2. Warn personnel if there is a dangerous situation developing which cannot be seen by another person.
3. Make the designated personnel aware they are in a dangerous area.
4. Be competent in recognizing fall hazards.
5. Be as close as practical to the monitored employees and within visual sighting distance.
6. Be close enough to communicate orally with the employees.
7. If the safety monitor becomes too encumbered with other responsibilities, the monitor shall (1) stop the erection process; and (2) turn over those responsibilities to trained personnel or (3) turn over the safety monitoring function to another designated, competent person.

The safety monitoring system shall not be used when the walking-working surfaces become icy or slippery.

Control Zone System

A controlled access zone, will be designated and clearly marked, in which leading edge work may take place without the use of guardrail, safety net or personal fall arrest systems to protect the employees in the area. Control zone systems shall comply with the following provisions:

1. When used to control access to areas where leading edge and other operations are taking place the controlled access zone shall be defined by a control line or by any other means that restricts access.

When control lines are used, they shall be erected not less than 6 feet nor more than 100 feet, from the leading edge.

2. The control line shall extend along the entire length of the unprotected or leading edge and shall be approximately parallel to the unprotected or leading edge.
3. The control line shall be connected on each side to a warning line system, wall, or guard rail.
4. Control lines shall consist of ropes, wires, tapes, or equivalent materials, and supporting stanchions as needed.
5. Each line shall be flagged or otherwise clearly marked at not more than 6-foot intervals with high-visibility material.
6. Each line shall be rigged and supported in such a way that it is easily seen and be 3 to 4 feet high from the walking/working surface.

II. Enforcement

Constant awareness of and respect for fall hazards, and compliance with all safety rules are considered conditions of employment. The Rigging Supervisor will perform regular reviews of work practices in the Control Zone. All employees have the authority to issue a stop work order.

III. Accident Investigations

All accidents that result in injury to workers, regardless of their nature, shall be investigated and reported. If an incident occurs, this plan shall be reviewed to determine if additional practices, procedures, or training need to be implemented to prevent similar types of falls or incidents from occurring.

IV. Changes to Plan

This plan shall be reviewed by the responsible Liaison Engineer as the job progresses to determine if additional practices, procedures or training needs to be implemented to improve or provide additional fall protection. Workers shall be notified and trained, if necessary, in the new procedures. A copy of this plan and all approved changes shall be provided with the work order.

Any changes to the plan will be approved by the Facilities and Experimental Support Group Supervisor.